# A CLEVER LOOK



The historic Kissimmee River supported a diverse complement of wading birds like this majestic great egret. District research on the Kissimmee River will be used to evaluate the success of the restoration project in reestablishing the river's natural heritage values. Ongoing studies also will provide a rigorous scientific basis for managing the resources of the restored river and floodplain ecosystem.

# Impacts of channelization provide basis for restoration plan

resources in the Kissimmee
River basin began in the mid-1950s
when the U.S. Fish and Wildlife
Service initiated annual surveys of
wintering waterfowl in the Kissimmee
chain of lakes, the river, and its adjacent floodplain wetlands. However,
since the 1960s, most environmental
research on the river has focused on
the impacts of channelization on water
quality, wetland and associated fish
and wildlife resources in the basin,
and the potential value of restoration
measures. These studies provided the

basis for the Kissimmee River restoration plan, which will restore 43 miles of river channel, 27,000 acres of floodplain wetlands, and is expected to benefit over 320 fish and wildlife species including the endangered wood stork, snail kite and bald eagle.

### Ecological evaluation program to track restoration of the river and floodplain

Current research on the river supports the project's comprehensive restoration evaluation program. The primary purpose of this ecological evaluation program is to evaluate the success of the restoration project in

# In review...

Kissimmee

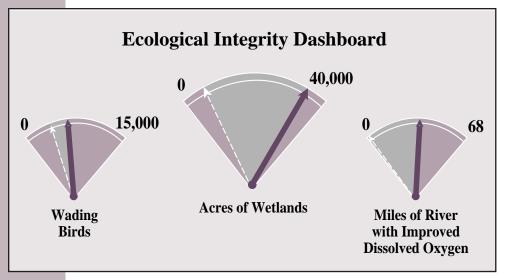
Research

River

- Research on the Kissimmee River is designed to evaluate the success of a comprehensive restoration project.
- Restoration evaluation studies will provide the necessary scientific information for expediting the recovery of wetland, fish and wildlife resources while maintaining flood protection.
- The restoration evaluation program includes a range of ecological components such as fish, wading birds, waterfowl, amphibians, reptiles, invertebrates and wetland plant species.

reestablishing the ecological integrity of the Kissimmee River ecosystem. This goal reflects a desire to restore the river and floodplain so it is once again project and management of the restored ecosystem.

A basic premise of the Kissimmee River restoration project is that the elimination of



The success of the restoration project in reestablishing ecological integrity will be evaluated using a suite of indicators including wetland area, wading bird populations and miles of river with improved dissolved oxygen levels. Studies will track the recovery of these and other ecological components of the system by measuring response trajectories (gray areas) from the existing, baseline state (dotted-line arrows) toward expected restoration targets (bold arrows).

capable of supporting the historic ecosystem's complement of fish and wildlife. By closely tracking the recovery of environmental resources, restoration evaluation studies also will provide the necessary scientific information for fine-tuning subsequent phases of the restoration

the flood control canal, water control structures and levees, and the reestablishment of natural water levels and flow will provide the habitat template and driving force for restoration of ecological integrity. A key objective of restoration evaluation studies then is to document that reestab-

lished flow through the river channel and reinundation of the floodplain lead to the restoration of historic habitat characteristics. These characteristics include a meandering river channel with a diversity of depths and natural substrate characteristics (predominantly sand), and a mosaic of wetland plant communities on the floodplain. The historic floodplain was dominated by broadleaf (arrowhead and pickerelweed) marsh, buttonbush and willow shrub prairies. Reestablishment of these wetland habitats will provide early measures of restoration success and will be delineated and mapped through interpretation of aerial photography.

Reestablishment of flow is expected to lead to increased dissolved oxygen levels within the restored river channel. Low dispersions

communities, and diverse wet

Reestablishment of flow is expected to lead to increased dissolved oxygen levels within the restored river channel. Low dissolved oxygen concentrations are the principal water quality problem and a major source of habitat degradation that limits populations of fish species within the channelized system. Thus, documentation of the effects of restoration on dissolved oxygen regimes will be a focus of water quality investigations.

The next step in the evaluation of the restoration process will be to show cause-and-effect relationships between the reestablishment of these habitat characteristics and expected

basic premise of the Kissimmee River restoration project is that the reestablishement of natural water levels and flow will provide the habitat template and driving force for restoration of ecological integrity.

responses by a suite of ecological indicators. The selection of indicators for evaluating restoration was based on a prioritization process that favored components of the ecosystem that are expected to show reliable short- and long-term responses, that are efficient to monitor, and that will provide useful information for



District and Florida Game and Fresh Water Fish Commission biologists are monitoring population densities of game fish species such as largemouth bass, bluegill and black crappie, which will provide key indicators of restoration of recreational and associated economic values of the river system.



The restoration project is expected to reestablish breeding, feeding and nursery habitat for a variety of avian species including wading birds, waterfowl and the endangered wood stork, snail kite and bald eagle. The wading bird community of the channelized river currently is dominated by cattle egrets, as shown here, a non-native species that typically dwells in upland, pasture habitats.

managing the recovering and restored system.

The highest priority components are species of recreational, economic, and natural heritage value. These include game fish (largemouth bass, black crappie, and bluegill), wading birds, waterfowl, and threatened and endangered species. Restoration evaluation studies will document the



District researchers are using a network of surface water gauges to monitor the reestablishment of historical hydrologic characteristics and ensure maintenance of flood protection in the basin.

recovery of these groups by measuring changes in population densities and, particularly, their use of restored river and floodplain habitats for reproduction. Reproductive success is a key indicator of the health and likely persistence of biological populations with-

in the restored system. The provision of restored breeding, feeding, and nursery habitat could benefit regional populations of some species, especially, wading birds, the endangered snail kite, wood stork, and bald eagle. The diversity (number and relative abundance of

species) of fish, birds, amphibians, and reptiles will provide another important measure of restoration success. In addition to linking the recovery of species to restored habitat conditions, the evaluation program will track the restoration process by monitoring the reestablishment of aquatic food chains, including the productivity of base components such as aquatic invertebrates (insects, crayfish, snails, and clams).

As with wading birds and endangered species, the Kissimmee River restoration project is expected to have regional, as well as, local effects on water quality. Reestablished overbank flow and functional floodplain wetlands are expected to lead to increased nutrient filtration and, thereby, decreased downstream transport of nitrogen and phosphorus loads to Lake Okeechobee. Effects of the restoration project on nutrient concentrations and transport will be a key element of water quality monitoring studies.

The restoration evaluation studies also will include the upper basin component of the project where effects of the increased range of water level fluctuation will be tracked by mapping the predicted expansion of littoral wetland plant communities in lakes Kissimmee, Cypress and Hatchineha.

Ongoing studies will ensure maintenance of flood control and protection of existing resources

The Kissimmee River evaluation program also includes studies that will ensure the restoration project will not result in any loss of social or economic services. The hydraulic performance (water levels and flow) of the reconstructed system will be closely monitored to maintain required levels of flood protection in the basin and develop optimum operational rules for water management in the headwater lakes. An important component of the hydraulic monitoring studies will be to determine resistance to flow over the restored floodplain. This will be a critical factor in ensuring the design and operation of the reconstructed system will meet flood control requirements in the basin. Water surface profiles and flow pathways will be measured with a network of water level recorders within the restored river and floodplain.

The Kissimmee River restoration project involves massive reconstruction of the system, which must be conducted in an environmentally sensitive manner. Restoration evaluation studies are designed to help minimize the potential for unintentional impacts to system resources. The greatest concern is for possible generation of high tur-



- Florida Game and Freshwater Fish Commission
- Archbold Biological Station
- Florida universities
- U.S. Army Corps of Engineers Waterways Experiment Station

bidity and suspended solids during backfilling, when the spoil from the original canal excavation will be redeposited in the canal.

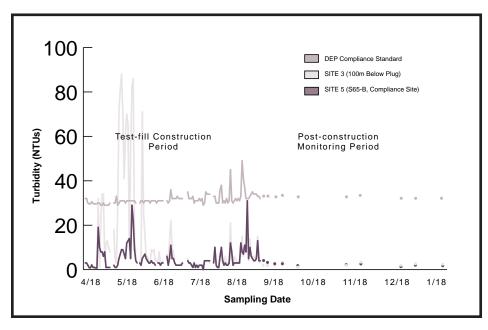
Subsequently, reestablishment of flow could flush accumulated organic deposits in remnant river channels.

Both of these concerns were largely

Che Kissimmee River restoration project involves massive reconstruction of the system, which must be conducted in an environmentally sensitive manner. upstream and downstream of the testfill construction.

### Current research focusing on on the Kissimmee River is summarized

Current evaluation studies for the Kissimmee River restoration project are establishing the baseline (preconstruction) database for tracking expected changes and responses. Restoration evaluation studies are led by District staff in collaboration with the U.S. Army Corps of Engineers (Jacksonville District and Waterways Experiment Station), Florida Game and Fresh Water Fish Commission, Archbold Biological Station, and various university researchers. The District's Riverwoods Field Laboratory is the main staging area



Monitoring of the pilot, 1,000-foot, test-fill project showed that water quality impacts of canal backfilling will be limited to the immediate vicinity of the reconstruction and of short duration. This graph shows turbidity levels (Nephelometric Turbidity Units (NTUs)) in the canal during (April-August 1994) and after (September 1994 - January 1995) the test-fill construction, at monitoring sites one-half mile (site 5) and immediately below (site 3) the backfilled canal. The test-fill construction was regulated by the Department of Environmental Protection (DEP) permit compliance standard.

alleviated by evaluation studies during the 1994 pilot test-fill project, which backfilled 1,000 feet of canal and marked the beginning of the dechannelization. Test-fill sampling confirmed that effects of canal backfilling on turbidity and suspended solids will be temporary and localized, as elevated turbidity and suspended solids were detected only intermittantly and immediately

for restoration research on the river.

A comprehensive restoration evaluation program is the cornerstone of ongoing research within the Kissimmee River basin. Restoration evaluation studies will document the recovery of fish, wildlife and other ecological resources and provide the necessary information for management of the restored river and floodplain ecosystem.

## What's ahead...

- Determine restoration success by tracking environmental responses from the existing baseline condition to a historically based reference state.
- Continue to monitor water quality and stability of each phase of the restoration project.
- Fine-tune the project to minimize erosion as well as sediment transport from reconstructed features and disturbed areas such as the backfilled canal, spoil banks and new river channel construction.
- Utilize results of restoration evaluation studies to develop management plans for resources of the recovering and restored ecosystem.



For more information on Kissimmee River Research, please contact the SFWMD at (561) 686-8800.

For news on other SFWMD research projects, please see the following *Closer Look* publications:

- An Overview of Current SFWMD Research
- ESTUARY RESEARCH
- Everglades Research
- Lake Okeechobee Research
- SOUTHERN EVERGLADES AND FLORIDA BAY RESEARCH
- STORMWATER TREATMENT AND SUPPLEMENTAL TECHNOLOGY RESEARCH